

We Claim:

1. An NMR system comprising, in combination:  
an NMR probe comprising multiple NMR detection sites each comprising a sample holding void, and an associated NMR microcoil; and  
a controllable fluid router operative to direct fluid sample to the multiple NMR detection sites.
2. The NMR system of claim 1 wherein the multiple NMR sites are integrated in a probe module.
3. The NMR system of claim 2 wherein the sample holding void of each of the NMR detection sites is in a capillary-scale fluid channel in the module.
4. The NMR system of claim 2 wherein the sample holding void of each of the NMR detection sites is in a micro-scale fluid channel in the module.
5. The NMR system of claim 1 wherein the controllable fluid router is operative in response to an electrical input signal.
6. The NMR system of claim 1 wherein the controllable fluid router is operative to direct fluid sample to any selected ones of the NMR detection sites.

7. The NMR system of claim 1 wherein the controllable fluid router is operative to direct fluid sample to any selected ones of the NMR detection sites corresponding to the input signal.

8. The NMR system of claim 7 further comprising an operative component in communication with the router and operative to generate the input signal to the router.

9. The NMR system of claim 8 wherein the multiple NMR sites and the operative component are integrated in a probe module.

10. The NMR system of claim 7 further comprising a controller unit in communication with the router and operative to generate the input signal to the router.

11. The NMR system of claim 10 wherein the multiple NMR sites and the controller unit are integrated in a probe module.

12. The NMR system of claim 5 further comprising a controller unit operative to receive information from any of the multiple NMR detection sites and to generate the input signal to the router based at least in part on said information.

13. The NMR system of claim 5 further comprising an operative component and a controller unit operative to receive information from the operative component and to generate the input signal to the router based at least in part on said information.

14. The NMR system of claim 13 wherein the operative component, the controller unit and the multiple NMR sites are integrated in a probe module.

15. The NMR system of claim 1 wherein one or more of the multiple NMR detection sites are in communication with a data processing unit.

16. The NMR system of claim 15 wherein the data processing unit is integrated in a probe module.

17. The NMR probe module of claim 15 wherein the data processing unit provides an input signal to the controllable router.

18. An NMR probe module comprising:

multiple NMR detection sites each comprising a sample holding void and an associated NMR microcoil; and  
a controllable fluid router operative to direct fluid sample to the multiple NMR detection sites.

19. An NMR smart probe comprising:

multiple NMR detection sites each comprising a sample holding void and an associated NMR microcoil;

a controllable fluid router operative in response to an electrical input signal to direct fluid sample to the multiple NMR detection sites; and

a controller unit in communication with the router and operative to generate the input signal to the router.

20. A NMR probe module comprising:

at least one fluid inlet port, operative to receive a fluid sample,

a fluid pathway comprising multiple channels in fluid communication with the at least one fluid inlet port, for the transport of fluid sample to be tested;

multiple NMR detection sites, each in fluid communication with at least one of the multiple channels, each comprising:

a sample holding void, and

an associated NMR microcoil; and

a controllable fluid router operative to direct fluid sample in the module to at least a selected one of the multiple channels.

21. The NMR probe module of claim 20 wherein the controllable fluid router is operative in response to an electrical input signal to direct fluid sample in the module to at least a selected one of the multiple channels corresponding to the input signal.

22. The NMR probe module of claim 21 wherein the sample holding void is in a capillary-scale fluid channel.

23. The NMR probe module of claim 21 wherein the sample holding void is in a micro-scale fluid channel.

24. The NMR probe module of claim 20 further comprising an outlet port in fluid communication with the fluid pathway.

25. The NMR probe module of claim 20 wherein the multiple NMR detection sites each is optimized for different nuclear species.

26. The NMR probe module of claim 20 wherein at least one of the multiple NMR detection sites is optimized for 1 dimensional NMR study.

27. The NMR probe module of claim 20 wherein at least one of the multiple NMR detection sites is optimized for 2 dimensional NMR study.

28. The NMR probe module of claim 20 wherein the multiple NMR detection sites are optimized for different sample sizes.

29. The NMR probe module of claim 20 wherein the multiple NMR detection sites are optimized using different materials.

30. The NMR probe module of claim 20 wherein the multiple NMR detection sites are made of fused silica and PEEK.

31. The NMR probe module of claim 20 wherein the multiple NMR detection sites are made of fused silica and polytetrafluoroethylene. .

32. The NMR probe module of claim 1 wherein each of the multiple NMR detection sites are optimized differently.

33. The NMR probe module of claim 1 wherein the microcoil is helical, solenoidal or spiral.

34. The NMR probe module of claim 1 wherein the microcoil is planar.

35. The NMR probe module of claim 20 wherein the module further comprises an analyte extraction chamber in fluid communication with at least one of the NMR detection sites.

36. The NMR probe module of claim 35 wherein the analyte extraction chamber is operative to perform liquid chromatography.

37. The NMR probe module of claim 35 wherein the analyte extraction chamber is operative to perform capillary electrophoresis.

38. The NMR probe module of claim 35 wherein the analyte extraction chamber is operative to perform dynamic field gradient focusing.

39. The NMR probe module of claim 35 wherein the analyte extraction chamber is operative to perform electric field gradient focusing.

40. The NMR probe module of claim 20 further comprising at least one operative component in communication with the fluid pathway.

41. The NMR probe module of claim 40 wherein the operative component is a heating device.

42. The NMR probe module of claim 40 wherein the operative component is a sonication device.

43. The NMR probe module of claim 40 wherein the operative component is reaction site.

44. The NMR probe module of claim 40 wherein the operative component is in electrical communication with the controllable gate.

45. The NMR probe module of claim 40 wherein the operative component is in communication with the one or more of the NMR detector sites.

46. The NMR probe module of claim 40 wherein the operative component is an IR detector.

47. The NMR probe module of claim 40 wherein the one operative component is a photodiode array.

48. The NMR probe module of claim 40 wherein the operative component is a UV visibility array.

49. The NMR probe module of claim 40 wherein the operative component is a micro-controller.

50. The NMR probe module of claim 40 wherein the operative component is a memory module.

51. The NMR probe module of claim 40 wherein the operative component is in communication with a data processing unit.

52. The NMR probe module of claim 40 wherein the operative component is in communication with a controller unit.

53. The NMR probe module of claim 40 wherein the operative component is a pump.

54. An NMR probe module comprising:

- at least one fluid inlet port, operative to receive a fluid sample;
- a fluid pathway comprising multiple channels in fluid communication with the at least one fluid inlet port, for the transport of fluid sample to be tested; and
- multiple NMR detection cells, each in fluid communication with a corresponding one of the multiple channels and comprising:
  - an enlarged void for holding a fluid sample, and
  - an associated NMR microcoil.

55. The NMR probe module of claim 54 further comprising a controllable fluid router operative to direct fluid sample in the module to selected ones of the multiple channels.